

## PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Takashi Horai et al.  
Application No. : 10/693,314  
Filed : October 24, 2003  
For : METHOD AND APPARATUS FOR RECORDING DATA IN  
OPTICAL RECORDING MEDIUM AND OPTICAL RECORDING  
MEDIUM

Examiner : Latanya Bibbins  
Art Unit : 2627  
Docket No. : 890050.445  
Date : May 30, 2007

Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION OF TAKASHI HORAI, NARUTOSHI FUKUZAWA,  
AND SYUJI TSUKAMOTO UNDER 37 CFR 1.131

Sir:

We, Takashi Horai, Narutoshi Fukuzawa, and Syuji Tsukamoto, hereby declare as follows:

1. We are three of the four co-inventors of the above-listed patent application which has been filed in the U.S. Patent and Trademark Office.
2. We declare that the fourth co-inventor of the above-listed patent application, Mr. Hiroyuki Arioka, has resigned from TDK Corporation and could not be located for purposes of signing this Declaration.
3. We had conceived of, and reduced the present invention to practice prior to September 10, 2002, the filing date of U.S. Patent Application No. 2003/0067857 to Shirota et al. (hereafter "Shirota et al.") In particular, prior to September 10, 2002, we, the named inventors, had reduced to practice the invention of claims 1-12 of the above-referenced application as originally filed.

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4. As evidence of our having conceived and reduced to practice the invention prior to the date of September 10, 2002, attached herewith as Exhibit A is a copy of two pages evidencing reduction to practice of the invention. These documents provide evidence of actually carrying out the practice of the invention and the operation of working examples. (The boxes marked with the numbers #1, #2, #3, #4 and #5 have been added by the U.S. patent attorney for ease of reference in the translation.)

5. Exhibit A is a document prepared by the inventors evidencing the practicing of the invention. This document, in Japanese, shows on pages 1 and 2 actual examples being carried out practicing the claimed invention. In particular, as can be seen looking at the example on page 1, the power  $nT_{top}$  is 1.8 and the ratio of the power  $Ph/P_m$  has been set in Example 1 to be 1.43. (In the application filed in the U.S.,  $nT_{top}$  is referred to as  $t_{top2}$  and the recording power was represented as  $P_w$  in place of  $Ph$ , so this corresponds to a ratio of  $P_w/P_m$  of 1.43 of the claimed invention.) See column 2 of the chart showing the example on page 1 of Exhibit A. Turning now to page 2 of Exhibit A, further results of working examples of the invention are shown. On page 2, a chart is provided that has working examples each labeled as Example 1, Example 2 and Example 3 by the U.S. patent attorney. In addition, in each of the examples, the recording level  $nT_{top}$  has been set to 1.8, 1.9, and 1.7, respectively, so that in each example this power is equal to or greater than 1.7 T, which is a feature of the claims.

6. As can be seen from the second page of Exhibit A, the conditions for recording in the reduction to practice of the invention presented as examples 1, 2 and 3 were provided as the working examples having the recording conditions 1, 2 and 3 in the application as filed.

7. Page 2 of Exhibit A also contains further evidence of the invention being reduced to practice in the note Mr. Horai added at the bottom, enclosed in Box #5. This note states that the recording was conducted with an  $nT_{top}$  of 1.9 and the  $Ph/P_m$  of 1.45. This is further evidence of practicing the invention. Thus, Exhibit A provides the evidence of the actual working examples for the reduction to practice of the present application as filed in the U.S. Patent and Trademark Office.

8. We further declare that page 1 of the attached Exhibit A was completed prior to July 12, 2002. It was provided on July 12, 2002 by TDK to the law firm of Oishi and

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Partners to prepare the present application. Page 2 of Exhibit A was personally prepared by Mr. Horai on July 16, 2002. This page 2 was prepared by Mr. Horai by adding the additional working examples on page 2 to the electronic document which had existed as page 1. For example, as can be seen, pages 1 and 2 are identical in many respects except for the additions Mr. Horai made on page 2 on July 16, 2002. Page 1 has one working example which shows an operational embodiment of the invention as now claimed. When page 2 was prepared, Mr. Horai added two additional examples of carrying out the present invention to further verify the parameters of operation as now claimed in the present application. Therefore, on page 2, Mr. Horai personally added the data of examples 2 and 3. In addition, Mr. Horai added the note at the bottom that in example 2 the recording was carried out with an nT<sub>top</sub> of one of 1.9 T and a  $\phi$ /pm of 1.45. Mr. Horai then noted that such a result had never been obtained before. This can be seen as the additional box on the lower part of page 2 of Exhibit A.

9. In conclusion, Exhibit A, pages 1 and 2, provides actual working examples of the inventors having reduced to practice the claimed invention and having provided these working examples to the patent attorneys in Japan who prepared the application for filing to cover the present invention which was subsequently filed in the U.S. Patent and Trademark Office.

10. While the documents of Exhibit A do not on the face thereof have a date, we have personally verified that date of Exhibit A, page 1 to be completed by July 12, 2002 and page 2 to have been prepared by Mr. Horai personally on July 16, 2002.

11. Further, we provided these documents to the patent attorney in Japan of Mr. Oishi's firm, who prepared the application on behalf of TDK on the date of July 12, 2002 and shortly after July 16, 2002, respectively. These were used to prepare a new application, bearing Japanese Application No. 2002-316216, which was subsequently filed in the United States in correspondence to the present application.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information or belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United

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States Code, and that such willful false statements may jeopardize the validity of the captioned patent application or any patent issued therefrom.

May. 31, 2007  
Date

Takashi Horai  
Takashi Horai

May. 31, 2007  
Date

Narutoshi Fukuzawa  
Narutoshi Fukuzawa

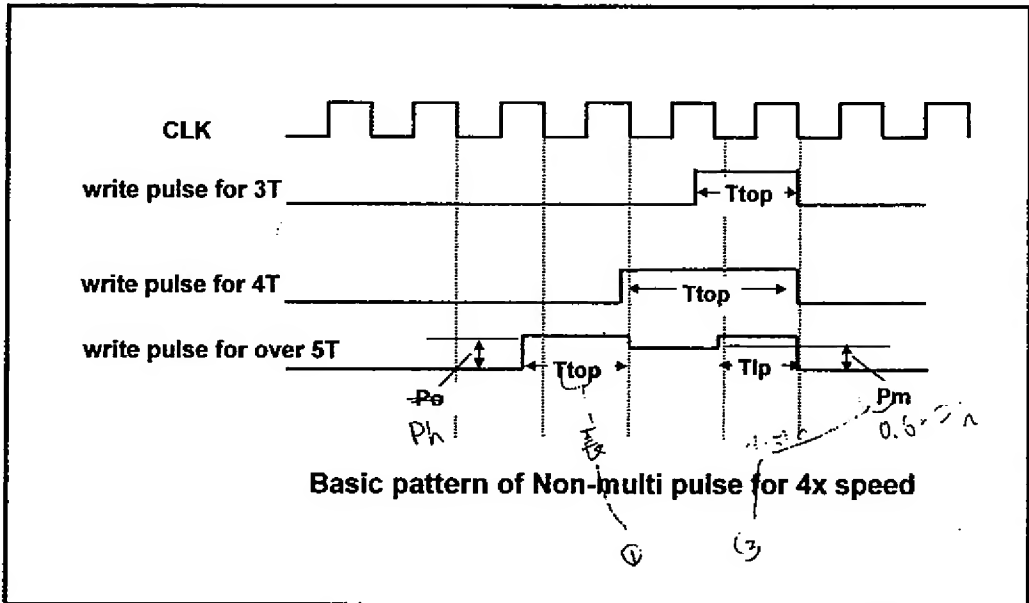
May 31, 2007  
Date

Syuji Tsukamoto  
Syuji Tsukamoto

Attachment: Exhibit A

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965111\_1.DOC

8)



○上はDVD-R4倍速記録で提案されているストラテジです。

#1

	type1	type2
3T <sub>top</sub>	2.25	2.25
4T <sub>top</sub>	2.60	2.50
nT <sub>top</sub>	1.50	1.50
nT <sub>wt</sub>	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00

・Basic Write Strategyとして左記の2タイプが決められています。  
 メディアによって最適なパワー比があり、おそらく実機ではその比率のもとに最適パワーをコントロールするはずですが、TDK内での検討の結果、この2タイプの5T以上のT<sub>top</sub>を長めにしてPh/P<sub>m</sub>比を大きく(P<sub>m</sub>を小さく)した方が、ジッターのマーヅンが広くなる結果が得られました。

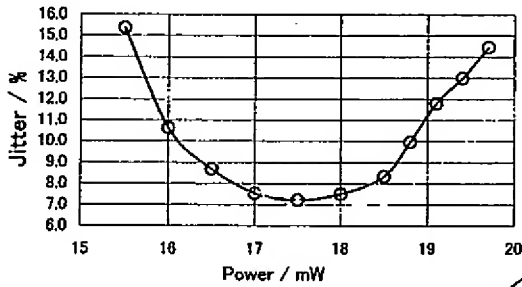
#2

「実施例」"Example"

	type2	実施例
3T <sub>top</sub>	2.25	2.25
4T <sub>top</sub>	2.50	2.50
nT <sub>top</sub>	1.50	1.80
nT <sub>wt</sub>	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00

Ph/P<sub>m</sub> 1.38 1.43

Jitter margin (4x)



○ type2

Example  
 実施例

理由の推測ですが、  
 ・5T以上のマークにはP<sub>m</sub>(ミドルパワー)を設定して記録するので、Ph/P<sub>m</sub>比とT<sub>top</sub>(トップパルス)とT<sub>lp</sub>(ラストパルス)でマーク長を調節できます。  
 たとえばTDKメディアはPh/P<sub>m</sub> 1.38、18mW程度で特性ボトムになりますが、高パワーになったときにはPh/P<sub>m</sub> 1.38ではなく、P<sub>m</sub>比を上げたほうが実は特性が良い。しかしPh/P<sub>m</sub>比はドライブでは固定である。  
 それに対し、実施例はT<sub>top</sub>長めにしてマーク長を形成しているので、P<sub>m</sub>の依存性がより小さい。よってジッターの劣化が小さい。

「効果」

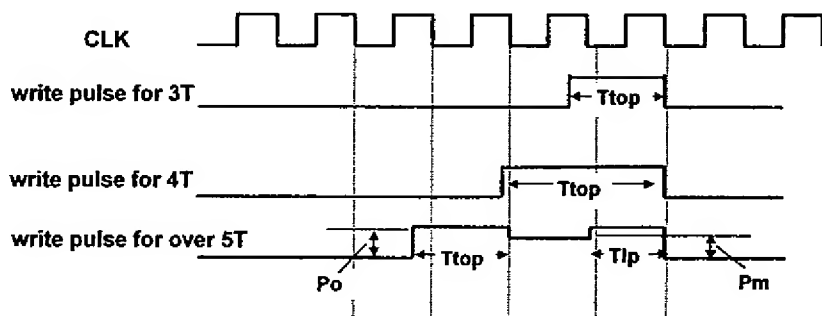
・ドライブのパワーバラツキ、メディアの感度バラツキに対しては広いマーヅンを持っていたほうが良いので、実施例ストラテジが有効。

「手段」

Basic Write Strategyよりも、5T以降のマークのT<sub>top</sub>長めに、P<sub>m</sub>小さめにする。  
 好ましくはnT<sub>top</sub> 1.70T以上2.00T以下。(いま実施例が1つしかないです。近々検討の予定)。

#3

#4



Basic pattern of Non-multi pulse for 4x speed

○上はDVD—R4倍速記録で提案されているストラテジです。

#1

	type1	type2
3T <sub>top</sub>	2.25	2.25
4T <sub>top</sub>	2.60	2.50
nT <sub>top</sub>	1.50	1.50
nT <sub>wt</sub>	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00

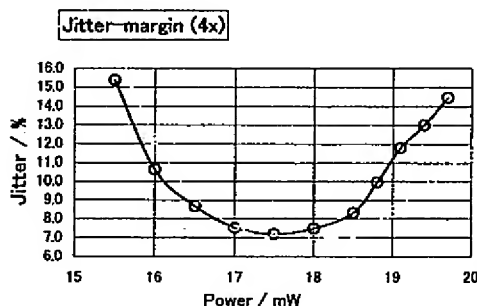
・Basic Write Strategyとして左記の2タイプが決められています。  
メディアによって最適なパワー比があり、おそらく実機ではその比率のもとに最適パワーをコントロールするはずですが、TDK内での検討の結果、この2タイプの5T以上の $T_{top}$ を長めにして $Ph/P_m$ 比を大きく( $P_m$ を小さく)した方が、ジッターのマーヅンが広くなる結果が得られました。

#2

Example 1 Example 2 Example 3

	type2	実施例1	実施例2	実施例3
3T <sub>top</sub>	2.25	2.25	2.25	2.25
4T <sub>top</sub>	2.50	2.50	2.50	2.50
nT <sub>top</sub>	1.50	1.80	1.90	1.70
nT <sub>wt</sub>	(n-1)	(n-1)	(n-1)	(n-1)
nT <sub>lp</sub>	1.00	1.00	1.00	1.00

Ph/P<sub>m</sub> 1.38 1.43 ? ?



○ type2

実施例1

Example 1

理由の推測ですが、

・5T以上のマークには $P_m$ (ミドルパワー)を設定して記録するので、 $Ph/P_m$ 比と $T_{top}$ (トップパルス)と $T_{lp}$ (ラストパルス)でマーク長を調節できます。  
たとえばTDKメディアは $Ph/P_m$  1.38、18mW程度で特性ボトムになりますが、高パワーになったときには $Ph/P_m$  1.38ではなく、 $P_m$ 比を上げたほうが実は特性が良い。しかし $Ph/P_m$ 比はドライブでは固定である。  
それに対し、実施例は $T_{top}$ 長めにしてマーク長を形成しているので、 $P_m$ の依存性がより小さい。よってジッターの劣化が小さい。

「効果」

・ドライブのパワーバラツキ、メディアの感度バラツキに対しては広いマーヅンを持っていたほうが良いので、実施例ストラテヅが有効。

「手段」

Basic Write Strategyよりも、5T以降のマークの $T_{top}$ 長めに、 $P_m$ 小さめにする。  
好ましくはnT<sub>top</sub> 1.70T以上2.00T以下。(いま実施例が1つしかないです。近々検討の予定)。

#3

「実施例2」

・上記 nT<sub>top</sub> を1.9Tとし、 $Ph/P_m$ を1.45として記録した。  
(結果はまだありません)

#5